

The listing of the claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (Currently Amended): Device for detecting an environmental influence (15) on a sensor (5), by means of detecting a change in an electrical conductivity of a sensor layer (3) of the sensor (5), whereby the sensor (5) has a first (7) and a second (9) excitation electrode, a piezoelectric material (11), and a sensor layer (3), which comprises: an excitation unit for generating electrical potentials (13), which are passed to the piezoelectric material by way of the first (7) and the second (9) excitation electrode, whereby the sensor layer (3) rests against both at least one excitation electrode and the piezoelectric material, at least in certain regions, and the sensor layer (3) has a conductivity that is dependent on environmental influences, so that the piezoelectric material can be excited to vibrate by means of the excitation electrodes and the sensor layer (3), ~~characterized in that~~ wherein a frequency measurement device (17) makes it possible to detect a vibration order of the piezoelectric material.

Claim 2 (Currently Amended): Device according to claim 1,  
~~characterized in that~~ wherein the excitation unit (13) is formed  
by means of an oscillation circuit or a network analyzer.

Claim 3 (Currently Amended): Device according to ~~one of the~~  
~~preceding claims~~ claim 1, ~~characterized in that~~ wherein the  
excitation electrode is formed from a metal, a non-oxide ceramic,  
oxide ceramic, or a precious metal.

Claim 4 (Currently Amended): Device according to ~~one of the~~  
~~preceding claims~~ claim 1, ~~characterized in that~~ wherein the  
excitation electrode lies directly against the piezoelectric  
material.

Claim 5 (Currently Amended): Device according to ~~one of the~~  
~~preceding claims~~ claim 1, ~~characterized in that~~ wherein the first  
excitation electrode (7) lies against the piezoelectric material  
with an area that is as large as an area with which the second  
excitation electrode (9) lies against the piezoelectric material.

Claim 6 (Currently Amended): Device according to ~~one of the~~  
~~preceding claims~~ claim 1, ~~characterized in that~~ wherein the first

excitation electrode (7) lies against the piezoelectric material with an area that is larger than or smaller than an area with which the second excitation electrode (9) lies against the piezoelectric material.

Claim 7 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the excitation electrode(s) lie against the piezoelectric material with a circular area.

Claim 8 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the first excitation electrode (7) has a same geometry as the second excitation electrode (9).

Claim 9 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the piezoelectric material is formed from a quartz, from langasite, its isomorphous compounds, or from gallium orthophosphate, or is a piezoelectric material that is capable of functioning even at temperatures up to 1000°C.

Claim 10 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the piezoelectric material has the basic shape of a cylinder.

Claim 11 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the sensor layer (3) lies directly against the at least one excitation electrode and/or the piezoelectric material.

Claim 12 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the sensor layer (3) is configured in circular shape.

Claim 13 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the sensor layer (3) contains oxide ceramics, non-oxide ceramics, semiconductors, organic synthetic or natural polymers, ZnO, ZnS, TiO<sub>2</sub>, Se, CeO<sub>2</sub>, oxides of transition metals, proteins or nucleic acids.

Claim 14 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the

frequency measurement device (17) comprises a frequency counter.

Claim 15 (Currently Amended): Device according to ~~one of the preceding claims~~ claim 1, ~~characterized in that~~ wherein the vibration order is the first, third, fifth, or higher.

Claim 16 (Currently Amended): Method for detecting an environmental influence (15) on a sensor by means of detecting a change in the electrical conductivity of a sensor layer (3) of the sensor, using a device according to ~~one of claims 1 to 15~~ claim 1, which comprises the following steps:

1. Generating a fundamental tone in a piezoelectric material,
2. Measuring the resonance frequency of the vibration order of step 1,
3. Exerting an environmental influence (15) on the sensor layer (3), causing the conductivity of the sensor layer (3) to be changed and thereby causing the frequency spectrum of the piezoelectric material to be changed,
4. Measuring the vibration order after exertion of the environmental influence,

5. Calculating a resonance frequency difference that is formed from the difference of the resonance frequency of the vibration order of step 1 and the resonance frequency of the vibration order after changing the environmental influence, and

6. Correlating the extent of the environmental influence (15) with the resonance frequency difference.

Claim 17 (Currently Amended): Method according to claim 16, ~~characterized in that~~ wherein upper harmonics are also generated and measured in the piezoelectric material, which are also taken into consideration in detecting the type or the extent of the environmental influence (15).

Claim 18 (Currently Amended): Method according to ~~one of claims 16 or 17~~ claim 16, ~~characterized in that~~ wherein the resonance frequencies of the upper harmonics serve for a temperature compensation of the vibration behavior of the piezoelectric material.

Claim 19 (Currently Amended): Method according to ~~one of claims 16 to 18~~ claim 16, ~~characterized in that~~ wherein exerting

an environmental influence (15) comprises irradiation of the sensor layer (3) with high-energy radiation.

Claim 20 (Currently Amended): Method according to ~~one of~~  
~~claims 16 to 19~~ claim 16, ~~characterized in that~~ wherein the  
environmental influence (15) is the effect of a chemical or  
biological substance on the sensor layer (3), or a temperature  
change.

Claim 21 (Currently Amended): Method according to ~~one of~~  
~~claims 16 to 20~~ claim 16, ~~characterized in that~~ wherein signals  
that run periodically, particularly rectangular, sine, or  
triangular signals, are passed to the piezoelectric material by  
the excitation unit (13).

Claim 22 (Original): Arrangement (23) of a first sensor  
(5o) and a second sensor (5u) for detecting an environmental  
influence (15), whereby the first sensor (5o) has a first (7) and  
an opposite second (9) excitation electrode, a piezoelectric  
material (11) disposed between these, and a sensor layer (3) that  
covers the first excitation electrode (7) and also the  
piezoelectric material (11) at least in certain regions, and the

sensor layer (3) has a conductivity that is dependent on environmental influences (15), so that the piezoelectric material (11) can be excited to vibrate by means of electrical potentials from the excitation unit for generating electrical potentials (13), both by way of the excitation electrodes (7, 9) and by the sensor layer (3), and the resonance frequency of a vibration order of the piezoelectric material (11) can be detected by means of a frequency measurement device (17), and the second sensor (5u) has a first (7) and an opposite second (9) excitation electrode, a piezoelectric material (11) disposed between these, and a sensor layer (3) that covers the excitation electrode (9) at least in certain regions, but does not exceed it, and the sensor layer (3) has a conductivity that is dependent on environmental influences (15), whereby the sensor layer (3) is disposed in such a manner that the piezoelectric material (11) can be excited to vibrate exclusively by means of the excitation electrodes (7, 9), and the resonance frequency of a vibration order of the piezoelectric material can be detected by means of a frequency measurement device (17).

Claim 23 (Currently Amended): Arrangement according to claim 22, ~~characterized in that~~ wherein the piezoelectric material (11)



in the first sensor (5o) is identical with that of the second sensor (5u).

Claim 24 (Currently Amended): Arrangement according to claim ~~22 or 23~~, ~~characterized in that~~ wherein the materials of which the excitation electrodes of the first and second sensor (5o, 5u) consist are identical.

Claim 25 (Currently Amended): Arrangement according to ~~one of claims 22 to 24~~ claim 22, ~~characterized in that~~ wherein the material of which the sensor layer (3) of the first sensor (5o) is formed is identical with the second material of which the sensor layer (3) of the second sensor (5u) is formed.

Claim 26 (Currently Amended): Arrangement according to ~~one of claims 22 to 25~~ claim 22, ~~characterized in that~~ wherein the geometry in which the sensor layer (3) of the first sensor (5o) is shaped is identical with the geometry in which the sensor layer (3) of the second sensor (5u) is shaped.

Claim 27 (Original): Sensor device (25) for detecting an environmental influence (15), having a first (7) and a second (9) excitation electrode, a piezoelectric material (11) disposed

between these, and a sensor layer (3), whereby the first excitation electrode (7) is disposed on a first side of the piezoelectric material (11), and the second excitation electrode (9) is disposed on the opposite, second side of the piezoelectric material, and the sensor layer (3) lies against the first excitation electrode (7) with a first partial area A1, and against the piezoelectric material (11) with a second partial area A2, and the sensor layer (3) has a conductivity that is dependent on environmental influences, so that the piezoelectric material (11) can be excited to vibrate by means of electrical potentials from an excitation unit for generating electrical potentials (13), both by way of the excitation electrodes (7, 9) and by the sensor layer (3), and the resonance frequency of a vibration order of the piezoelectric material (11) can be detected by means of a frequency measurement device (17), and a third excitation electrode (27) is disposed on the second side of the piezoelectric material, which lies against the piezoelectric material (11) with an area A3, which is at least as large as the partial area A2 of the sensor layer (3) and, if this partial area A2 is projected onto the area A3, the partial area A2 is completely covered by the area A3, and the first, second, and third excitation electrode are electrically connected with a switching means (29) that connects the second (9) and third (27)

excitation electrode in electrically conductive manner in a first switching position, so that the conductivity of the sensor layer (3) can be detected, and the switching means (29) connects the first and third excitation electrode (27) in electrically conductive manner in a second switching position, so that the change in the vibration properties caused by deposit of substance of the environmental influence can be measured.

Claim 28 (Currently Amended): Sensor device according to claim 27, ~~characterized in that~~ wherein the first excitation electrode (7) is formed in the shape of a circular disk on one side of the piezoelectric material.

Claim 29 (Currently Amended): Sensor device according to claim 27 ~~or 28, characterized in that~~ wherein the second excitation electrode (9) is formed in the shape of a circular disk, and the third excitation electrode (27) is formed in the shape of a circular ring (31).

Claim 30 (Currently Amended): Sensor device according to claim 27, ~~characterized in that~~ wherein the sensor layer (3) lies directly against the first excitation electrode and is circular.

Claim 31 (Currently Amended): Sensor device according to ~~one~~  
~~of claims 27 to 30~~ claim 27, ~~characterized in that~~ wherein the  
piezoelectric material is formed in the shape of a cylinder (19),  
whereby the first, second, and third excitation electrode (27) as  
well as the piezoelectric material and the piezoelectric material  
have a common axis of symmetry.